Cactoblastis cactorum Activities Report for April 2006

Joel Floyd, USDA-APHIS-PPQ-EDP, Riverdale, MD

COMMUNICATIONS. A conference call was held between SAGARPA (Gustavo González Villalobos and Arturo Bello) and APHIS-PPQ (Joel Floyd, Stephanie Bloem, Ken Bloem) to discuss possible SAGARPA funding for 2007. A conference call was held with Ed Burns of the Florida Department of Food and Consumer Services, Division of Plant Industry (DPI) to discuss a proposal to work under a cooperative agreement to rear cactus moths at their facility in Gainesville, FL in cooperation with ARS in Tifton, GA.

IDENTIFICATION/SURVEY. The Mississippi State University GeoResources Institute's Cactus moth detection activities continue with logging of new host sites and sentinel sites. Richard Brown has received specimens from the Dominican Republic and South Africa for DNA analysis. He has also identified moths captured in traps in Puerto Rico where PPQ is helping ARS to collect adult emergence information for modeling.

REGULATION. Two work-plans are now in the APHIS Regulatory Analysis and Development staff undergoing economic analysis. One is the continental domestic regulation on *Opuntia*, *Consolea*, *Cylindropuntia*, *Nopalea*, prohibiting movement of live plant material from Alabama, Florida, Georgia, and South Carolina. The other tightens up existing territorial and Hawaiian restrictions and adds a prohibition of fresh plant material from foreign countries that have *Cactoblastis cactorum*.

OUTREACH. The IAEA new videos and DVD's were distributed to interested parties including PPQ in Nogales who are involved in outreach activities with the National Park Service in Arizona. Jim Carpenter forwarded specimens of adults, larvae and egg-sticks to the state entomologist for the Arizona Department of Agriculture. Articles on *C. cactorum* have appeared in the newsletters/magazines of the Southern Nursery Association, the South Carolina Nursery and Landscape Association, and the Texas Nursery and Landscape Association.

EQUIPMENT: Ten handheld personal data assistant and GPS units purchased by the IAEA were received and will be sent to Ron Weeks in CPHST Gulfport for programming.

PPQ FIELD ACTIVITY: Maurice Duffel along with other program workers, Buddy Cheslock and Carl Lightfoot are working with Stephen Hight in Ft. Morgan and Bon Secour removing infested *Opuntia* material. In the first two weeks of the month, they removed and destroyed over 3,160 lbs. of host material. We are still waiting to hear if the US Fish & Wildlife Service will approve our request for sterile release and additional host removal at Bon Secour Wildlife National Refuge. Maurice also found a possible location for the Pensacola program office. Craig Hinton, of the CPHST Gulfport Lab has continued to help Stephen Hight with trapping and host removal at Dauphin Island and Little Dauphin Island, AL

TECHNICAL LIAISON. Stephanie Bloem collected and compiled all reports for April program activities. Report was translated to Spanish for distribution to collaborators at SAGARPA/SENASICA.

Ken Bloem, USDA-APHIS-PPQ-CPHST, Raleigh, North Carolina

CACTUS MOTH DISPERSAL STUDIES. A collaborative project has been initiated with Dr. Silvia Dorn, ETH, Zurich, Switzerland, to assess the flight capacity and propensity of cactus moth adults. The goal is to understand whether the capture of males in pheromone traps can predict the simultaneous presence of females at the leading edge of an infestation, as well as the impact of radiation and shipping/release protocols on the performance moths being mass reared for SIT. Flight ability will be assessed in laboratory tests using computer-linked flight mills and actographs. These results will be used to formulate and test hypotheses on the dispersal characteristics of adult male and female moths in the field in Florida. A postdoctoral scientist, Dr. Mark Savary, will begin working on this project in Dr. Dorn's laboratory, June 15, 2006. Dr. Savary recently finished his Ph.D. at Cornell University.

REMOTE SENSING FOR CACTUS. The short wave infrared camera (SWIR) that was purchased in January 2005 finally appears to be operational with its own computer system and image capture card. It is hoped that the system will produce a 5 band multi-spectral image over an area of around 1km sq. Once the imagery is acquired, it will be necessary to ground truth the plots (which has already started in some areas in South Texas) and develop a classification and accuracy assessment. This will validate whether or not the system can be used to detect Opuntia. Right now the project is waiting on ARS to find the time to fly the camera systems in their aircraft and good weather.

CACTUS MOTH REARING WORKSHOP. A cactus moth rearing workshop has been proposed for the week of July 17, 2006, at ARS in Tifton, GA. The goal of the meeting would be to review current cactus moth rearing protocols, make suggestions for practical improvements, develop a list of research priorities, and help facilitate technology transfer to the Florida DACS, DPI, Gainesville, FL. A panel of insect rearing specialists including Drs. Frank Davis, Allen Cohen, Alan Bartlett, and John Hamm has been invited, as well as a number of other scientists from ARS, APHIS-PPQ and the Florida Department of Agriculture.

Stephen Hight, USDA-ARS-CMAVE Laboratory, Tallahassee, Florida
J. Carpenter, USDA-ARS-CPMRU Laboratory, Tifton, Georgia

SIT VALIDATION. Assistance with the SIT validation project was once again offered by Dr. Anne-Marie Calcott, APHIS-PPQ-CPHST, Gulfport, MS. Craig Hinton from her office worked with us last year, primarily servicing traps on Dauphin Island, but also assisting in sanitation activities and trapping at other sites. Craig began servicing traps this year at Dauphin Island on 10 April. Depending on his schedule, he will work with us on the SIT validation 2-3 days each week. All traps were serviced at least once per week at the SIT Validation Sites during the month of April. Total monthly trap catch of wild *C. cactorum* for each site is presented in Table 1. The average number of wild moths found in traps checked throughout April is also presented in Table 1. Releases of sterile *C. cactorum* were made in Alabama at Dauphin Island, Little Dauphin Island, and Ft. Morgan (Table 2). Release/recapture information for Ft. Morgan is presented in Table 3 and Figs. 1 and 2.

Table 1. Wild *Cactoblastis cactorum* caught in traps during April, 2006.

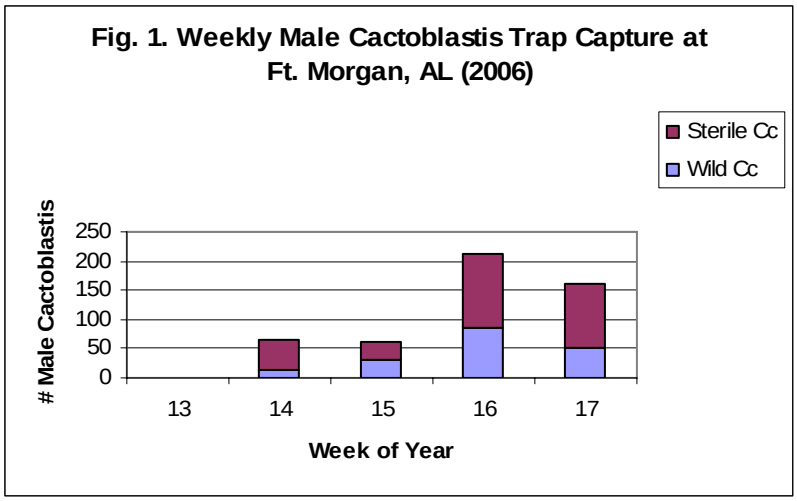
LOCATION	# TRAPS AT LOCATION	# WILD *C. cactorum* IN APRIL	MEAN # *C. cactorum* PER TRAP IN APRIL
Ft. Morgan, AL	16	182	1.1
Little Dauphin Island, AL	5	16	0.4
Dauphin Island, AL	53	2	0.006
Okaloosa Island, FL	33	236	1.8
St. George Island, FL	53	394	1.8
Pensacola Beach, FL	70	1824	6.5

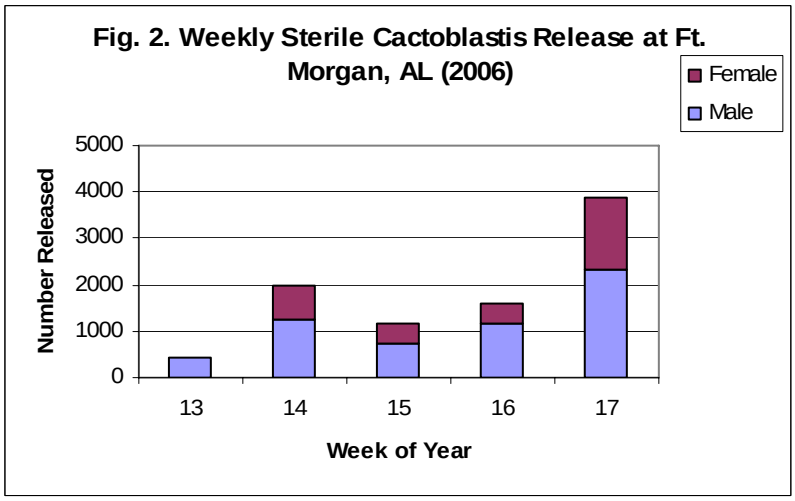
Table 2. April release totals of sterile *Cactoblastis cactorum* made at three Alabama sites.

LOCATION	NUMBER OF STERILE CACTUS MOTHS RELEASED		
	♂	♀	TOTAL
Ft. Morgan, AL	5439	5125	10564
Little Dauphin Island, AL	3162	1542	4704
Dauphin Island, AL	812	416	1228

Table 3. Weekly male *Cactoblastis cactorum* (Cc) trap capture, male and female sterile moths released, and percent sterile males released that were recaptured at Ft. Morgan, AL, February-April 2006.

MONTH	WEEK OF YEAR	Cc CAPTURED		STERILE Cc RELEASED		% STERILE ♂ Cc RECAPTURED
		WILD ♂ Cc	STERILE ♂ Cc	♂	♀	
February	8	0	--	--	--	--
March	12	0	--	--	--	--
March	13	1	0	443	0	--
April	14	13	52	1236	758	4.2
April	15	32	31	747	422	4.2
April	16	84	127	1144	456	11.1
April	17	52	110	2312	1547	1.5





Trapping Beyond Leading Edge. Phone discussion on locating traps was held with W.K. Glenn, APHIS-PPQ, Columbia, SC, and trapping supplies were sent.

ECOLOGICAL AND QUALITY CONTROL FIELD STUDIES. Flight Periods and Degree-Day Model**.** Site visits were conducted at South Carolina, Georgia, and north Florida locations. Information from temperature data loggers was downloaded and traps were serviced. Trap bottoms collected by collaborators were picked-up and returned to Tallahassee. Weekly trap bottoms from the 5 sites were scored, analysis updated, and outcomes forwarded back to collaborators. Additional trapping supplies were sent to Georgia collaborator.

Phylogenetic Analysis. Egg-sticks collected from two locations in South Carolina and one in Georgia were returned to Tallahassee for rearing. Once larvae reach the late instar age, they will be sent to Dr. Brown for phylogenetic analysis. Larvae from the South African colony were also sent to Dr. Brown.

Mating Status of Trapped *C. cactorum*. Staff at Tallahassee received training in the technique to determine the mating status of male cactus moths. Wild and recaptured male *C. cactorum* from

Fort Morgan sites now are routinely dissected and mating status is determined. This activity is important to aid in evaluating the competitiveness of released males, to determine age structure of the wild population, and to assist in targeting the most appropriate population sector for release of irradiated males.

Technology for Assessing Program Efficacy. During an SIT program such as the one to control *C. cactorum*, it is possible that traps used to monitor populations and over-flooding ratios may capture unmarked F_1 sterile males that cannot be distinguished from wild fertile males. This situation would be most prevalent during the first few generations following the initial releases of the irradiated insects. At Fort Morgan, this will occur during the summer and autumn moth flight of 2006. We evaluated several morphological, cytological, and physiological attributes that may be used to distinguish F_1 progeny of irradiated males from wild males captured in traps. We identified a cytological characteristic that can be used to accurately categorize these two male types regardless of age and mating status. This technique will allow us to improve the accuracy of estimating over-flooding ratio (irradiated/sterile : wild) and estimating competitiveness of released/irradiated males. A research manuscript describing this work is under preparation.

COLONY MAINTENANCE, BUILD-UP AND MASS-REARING. Cladode Rearing. 440 containers containing a total of 35,200 larvae were set-up during April. Approximately 35,000 pupae were collected.

Artificial Diet Rearing. Because of continued problems with disease in the larvae reared on artificial diet, most of the adults emerging from these colonies were used for release and not for egg production.

Artificial Diet Statistics.
Late instar larvae **lost to virus** during April – S.A. approx. 170,500, U.S. approx. 75,500
Larvae lost that **did not feed** during April – S.A. approx. 69,000.
Egg collection for April was approx. 50,000.
Pupae collected for the month of April – U.S. 20,000, S.A. 30,000.
Both colonies required approx. 80 liters of diet.
Currently there are approx. 100,000 larvae in various stages of production.
An additional 20,000 pupae collected but not ready for the emergence room.

REARING STUDIES. Diet trials for *C. cactorum* described in the March Progress Report are still ongoing.

R. Heath, N. Epsky, USDA-ARS-SHRS Laboratory, Homestead, Florida

Three shipments of pupae were received from ARS Tifton. Pupae were removed from cocoons, sexed, and placed in single sex cages that were held in separate rooms. Newly emerged adults were removed daily and placed in a separate cage by sex, so that all adults were of a known age, are unmated, and so that males are not pre-exposed to female pheromone prior to bioassay. Three runs of the flight tunnel bioassay were completed using 1-2 d old males. These bioassays

tested response to three of the new lure formulations. Additional lures were received from the company that is producing the experimental cactus moth lure. A set was sent to S. Hight for use in a field test as a continuation of the test of the 3, 4, 5 and 6 component lure formulations. A second set was obtained for development of new analytical techniques to improve the sensitivity of chemical analysis. Glands from calling females moths (1-2 d old) were removed and chemically extracted. Three sets of gland extracts were obtained, which consisted of 13, 26 and 23 glands per set. Approximately 55 gas chromatography analyses were conducted, 1) as part of research to develop new analytical techniques and 2) to chemically analyze the gland extracts. The newly developed analytical technique has improved peak resolution, and additional modifications are being tested to further improve sensitivity needed to identify and quantify the small quantities of chemical produced by females.